

 Fermilab	FACILITIES ENGINEERING SERVICES SECTION STANDARD POLICY AND PROCEDURES	FESS PROCEDURE 5035.0 Revision Number: 0.a Date of Last Revision: 12/06
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1. **PURPOSE:**

The Facilities Engineering Services Section (FESS) Operations' Department (Ops) program complies with the intent of Section 608 of the Clean Air Act of 1990 and Fermilab ES&H Manual (FESHM) Chapter 5035 Mechanical Refrigeration Systems 6/94. Compliance includes adherence to the Environmental Protection Agency (EPA) regulations that require:

1. Service practices that maximize recycling of ozone depleting compounds
2. That technicians are complying with the requirement of the rule
3. Repair of substantial leaks for systems with charges of 50 lbs or more
4. Establish vacuum levels for evacuation/recovery
5. That the refrigerant can be returned to the same system or other systems owned by Fermilab without restriction.
6. A certification program for recovery and recycling equipment
7. Allowable pressures for oil change to prevent refrigerant release during maintenance or refrigerant change
8. Best Management Practices are followed
9. Restrict the issue of refrigerant to those other than universal certified technicians
10. Safe disposal requirements for equipment and refrigerant appliances are utilized
11. Hazardous waste procedures for refrigerants and refrigerant oils are in compliance with Fermilab's existing hazardous waste disposal procedures

2. **SCOPE:**


This procedure applies to Fermilab employees.

3. **PROCEDURES:**

3.1 **REFRIGERANT MANAGER**

FESS/Ops have designated a Refrigerant Manager (RM) who oversees the implementation of the program and implementation of procedures and oversight as required by Section 608. The RM has the direct responsibility for:

- a. Refrigerant purchase, use, and reclamation
FESS/Ops Maintenance Storeroom Supervisor (MSS) oversees the complete purchase, inventory, and reclamation of refrigerant through the storeroom
- b. Technician certification
Technicians are required to have universal certification to work on systems
- c. Program documentation and record-keeping
 - 1 Provide guidance to lead the technician through the required process to follow for the use of refrigerant.
 - 2 Inventory and document all 50 lb or greater systems and under 50 lb systems as they are worked on or disposed of under his control. Track all refrigerant, refrigerant usage, and/or recovered refrigerant in those systems.
 - 3 Maintain service order records, refrigerant cylinders inventory, recovery/recycling units, and perform refrigerant audits
 4. RM will maintain refrigerant certification documentation for all refrigeration technicians
- d. Establishing an annual training program for the use and reclaiming of refrigerant.
- e. Review all refrigerant usage forms completed and submitted by the crafts and contractors and correct any information prior to submitting to data entry.

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- f. The RM coordinates with the MSS to determine the appropriate time to send out the recovered gas(s) for reclamation or disposal.
- g. The RM coordinates with the MSS to maintain hydrostatic testing requirements for all recovery cylinders.
- h. The RM will coordinate with supervision to monitor/audit the leak initial and follow-up verification testing methods of each technician to verify compliance and accountability with Section 608 and Chapter 5035.

4. PROGRAM DOCUMENTATION

- 4.1. Refrigerant work performed on equipment shall be detailed in the Refrigerant Service Order Form and that all data within the refrigerant database program is accurate and up-to-date. The form must be completely filled out
- 4.2. The RM must have technician information for all who will handle refrigerant under this program.
- 4.3 Refrigerant inventory including new and recovered and or contaminated shall be entered into and maintained in the database.
- 4.4 If the technician comes upon a piece of refrigerant equipment that does not have the necessary refrigerant program label, the technician shall fill out the Appliance Asset Input form and return to RM for entry into the database. If system is multi circuit, technicians shall note charge of each circuit.
- 4.5 Each technician may be issued a 30 lb cylinder of refrigerant that shall be weighed at issuance to ascertain weight of gas and tare weight of cylinder. The technician is accountable for all refrigerant issued. This can be achieved through proper documentation of the service work order or a method devised by the technician to track the refrigerant. The amount of refrigerant used must coincide with the service work orders, etc., completed during the month by the technician less any normal diminutive releases. Once the cylinder is emptied it must be weighed again before disposal to obtain a correct tare weight. This will assure a correct refrigerant usage.
- 4.6 When the technician is issued a FESS/Ops work order that will require the use of refrigerant, the technician must turn in a copy that work order along with the service work order to Refrigerant Database Support (RDS) to verify that all necessary equipment information match on both orders. If the service work order does not contain all necessary information, the form will be returned to the technician for completion. If the form is not returned completed, there will be a discrepancy in the technician's cylinder weight at the end of the month. The technician will be responsible for obtaining that information.
- 4.7 When disposing of appliances containing refrigerant, the technician shall initiate a service order input form completing the necessary information relating to the disposal of the unit. Be sure to indicate into which cylinder the refrigerant recovery was made.
- 4.8 The RM shall maintain the documentation for refrigerant contractors.
- 4.9 The RM is responsible for the documentation required for recovery/recycling units.

5. REFRIGERANT PURCHASING PROCESS

- 5.1 The MSS will record each cylinder serial number, type of refrigerant, and weight in pounds including tare weight.
- 5.2 The MSS has the responsibility of maintaining the necessary documentation (certification) to purchase refrigerant from reputable vendor.

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6. ISSUING REFRIGERANT

- 6.1 Only universal certified technicians and approved by FESS to perform refrigerant services are to be issued refrigerant.
- 6.2 The serial number of the cylinder will be assigned to the technician along with the cylinder weight and type of refrigerant.

7. DISPOSABLE REFRIGERANT CONTAINERS

- 7.1 There shall be no refrigerant remaining in the disposable refrigerant cylinders (DOT-39) and R-123 drums when placed in the designated disposal area(s).
- 7.2 It is the responsibility of the technician to remove any remaining gas to 4" vacuum in the cylinder by transferring it to a recovery cylinder of the same refrigerant type. Document the refrigerant transfer on the refrigerant transfer input form.
- 7.3 When removing refrigerant from a cylinder or drum, the technician should complete the necessary document that will help the technician track his refrigerant. (Refrigerant service order form or refrigerant transfer form)
- 7.4 When refrigerant cylinder is empty it shall be weighed and corresponding paperwork be completed to ensure the cylinder is de-activated in the database.

8. ON SITE STORAGE AND HANDLING OF REFRIGERANT

- 8.1 REFRIGERANT CYLINDERS SHALL NOT BE FILLED IN EXCESS OF 80% OF FLUID CAPACITY. Gross Legal Fill Weight (GLFW) for every cylinder, container, cylinder, or other vessel is always 80 percent of capacity. The responsibility rests with the technician to shut off the transfer machine at 80 percent cylinder fill for cylinders that don't do so automatically. By weight, the formula is as follows:

$$GLFW = (0.8 \times WC) + TW$$

WC = Water Capacity: the weight of the fluid that would fill the cylinder 100 percent.

TW = Tare Weight: the weight of the empty cylinder.

- 8.2 Oils that are extracted from refrigerant, recovery machines, or vacuum pumps shall be kept separate and stored in appropriately marked containment awaiting proper disposal shall be placed in the HUS area.
- 8.3 The FESS/Ops waste coordinator will monitor this area.
- 8.4 REFRIGERANT SHALL NOT BE MIXED. A designated recovery cylinder for each type gas used by FESS/Ops is marked and available at an area designated by the RM or MSS. The cylinder(s) marking should also indicate the condition of the refrigerant, that is, reclamation or disposal. The RM or MSS shall monitor this area. If a recovery cylinder is removed from this area by a technician for use in another area, this action (name, ID, date, cylinder #) shall be recorded on the log located in that area. Recovery cylinders shall be weighed when issued and weighed when returned. Paperwork shall show this weight of cylinder plus gas recovered. This needs to be input into the database. Documentation must be completed if a cylinder is issued to a person and that person loans it to another technician or stores in a building other than Site 38.



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9. REFRIGERANT RECLAMATION

- 9.1 It is the responsibility of the RM or MSS to assure the cylinders are in transportable condition, fill out the necessary documentation (Fermilab's material move request), and move the cylinders to the (inventory) area where a radioactive survey will take place before removal from site.
- 9.2 No recovery cylinder shall be used if its hydrostatic certification date has expired.

10. COMPLETE APPLIANCE DISPOSAL EVACUATION REQUIREMENTS

- 10.1 Evacuate equipment to recovery chart level or 4 inches vacuum. Document conditions if no recovery was possible. Complete scrap metal disposal procedure by affixing sticker/stamp on equipment indicating ready for disposal

11. LEAKING SYSTEM AND LEAK TESTING REQUIREMENTS

- 11.1 If a system holding refrigerant exceeds its leak rate limit, the RM shall be notified by either the technician servicing the equipment or the RDS to take immediate action to abate the leak in according with Section 608. When the alert rate alarm is indicated in the refrigerant software program, the RDS will issue the Schedule Service Input Form as a prompt for the RM to issue a corrective work order in FESS/Ops' CMMS system.
- 11.2 After repairs and prior to charging the system an initial leak verification shall be performed at the area(s) of repair and documented if successful on the refrigerant service order form. List date performed and method used.
- 11.3 After the successful initial test is performed and the system is placed back in operation a follow-up leak verification test shall be performed at the area(s) of repair and documented if successful. List date performed and method used.

12. CRAFT RESPONSIBILITIES

- 12.1 Provide proof of certification
- 12.2 Comply with technician requirements of the Act including:
 - removing refrigerant from all equipment prior to disposal
 - completion and submittal of refrigerant transfer form
 - completion of refrigerant service order form for all refrigerant services including recovery, addition of new and recovered refrigerants and description of where leaks were and what was done to repair
 - completion and documentation of initial and follow-up verification tests

13. TRAINING

- 13.1 Training records and certification records shall be part of the program compliance documentation.

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14. BEST MANAGEMENT PRACTICE

- 14.1. Technicians shall be required to attend an annual procedural training review provided by the RM or his designee.
- 14.2. Leak rates shall be established using RCM software (or equivalent calculation methods) and leaks repaired in 30 days for over 50 pound systems and as soon as practical on smaller equipment containing refrigerant.

15. BUILDING MANAGER RESPONSIBILITIES

- 15.1. Anyone contracting refrigeration technicians must comply with the procedures as set forth in this document and notify the FESS/OPS RM of personnel involved.
- 15.2. Notify the FESS/OPS RM of new installation or removal of existing refrigerant containing equipment.

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